Impact of Openness to Trade on Capital Formation in Developed and Emerging Markets: A Comparative Study

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ABSTRACT

While the volume of literature dealing with openness and growth is impressive, relatively few studies tackle the relationship between openness and investment in the emerging markets. This study attempts to determine the impact of openness to international trade on capital formation and whether such impact is any different for emerging markets than it is for developed countries. For the purpose of this study, six countries are selected: Canada, United States and United Kingdom for developed countries and Hungary, Thailand and India for emerging markets. Data over a twenty-year period is collected, ranging from 1983 to 2003. The openness to trade is measured in terms of the share of total trade in the GDP. An empirical model is specified and time-series regressions are employed individually for each country in question, using GDP per capita and population as control variables. Findings indicate that the impact of openness on capital formation is positive for all selected countries, but larger and more significant for emerging markets. These findings are substantiated by local market conditions and the advances in the telecommunication and information technologies throughout the sample period.

Malgré le fait que le volume des études qui s'intéressent à la relation entre l'ouverture et la croissance économique est immense, relativement peu d'études traitent de la relation entre l'ouverture économique et l'investissement dans les marchés émergents. Cette étude essaye de déterminer l'impact de l'ouverture au commerce internationale sur la formation du capital, ainsi que de vérifier si cet impact est différent pour les marchés émergents que pour les pays développés. Dans cette étude, six pays sont choisis: le Canada, le Royaume-Uni et les États-Unis comme pays développés ensuite l'Hongrie, la Thaïlande et l'Inde comme marchés émergents. Les données couvrant une période de vingt ans sont recueillies, soit de 1983 à 2003. L'ouverture au commerce internationale dans un pays se mesure par la part des échanges commerciaux totaux dans le PIB. Un modèle empirique est spécifié et des régressions (séries temporelles) individuelles sont effectuées pour chaque pays en question. Le PIB par habitant et la population sont utilisés comme variables de contrôle. Les résultats indiquent que l'impact de l'ouverture au commerce internationale sur l'investissement est positif pour tous les pays choisis, mais plus grand et plus significatif pour les marchés émergents, Cela s'explique par les conditions des marchés locaux et l'essor des technologies de télécommunication et d'information pendant la période étudiée.

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I. Introduction

The suggestion that openness to international trade is amongst the vehicles of economic growth dates back to the 19th century. From mid-century protectionist economic policies in a number of developing nations to today's gradual collapse of trade barriers, policymakers and economists changed their views regarding the significance of openness to trade considerably throughout the 20th century. Faced with the perspective of a global village, it is nothing but natural to question the dynamics that questionably link economic growth and a nation's openness to international trade. The notion that openness to international trade fuels growth via technological change has been explored heavily in the economic literature. A large scope of studies examines whether openness to international trade bears a favorable impact on the growth of gross domestic product, yet the results yield uncertain conclusions. Although a considerable number of such studies do find positive openness-growth relationships, the robustness of such results often comes under crossfire[1].

Studies dealing with the impact of openness on economic growth concentrate on gross domestic product and do relatively little to examine the standalone impact of openness to international trade on investment, a significant component of the GDP. Furthermore, although several studies do examine the impact of economic openness on capital formation in developed and developing countries, little has been done in a way to determine the significance of such an impact in *emerging markets* as a part of a comparative study. It is of interest to research into the relationship between openness to trade and investment for a number of reasons. First, not only would such knowledge beneficially contribute to the development of capital markets, but also to the development of markets for capital goods. Second, since investment is a vehicle for technological transfer, in-depth knowledge of the investment process converted into policy would significantly contribute to the economic development in the emerging markets.

[1] See section III below.

Using its prevalent definition, an emerging market refers to economic activity in a nation that is currently in a transitional stage between a developing and a developed status[2]. Such countries are restructuring their economies along market-oriented lines and offer a wealth of revealed opportunities in trade, technology transfers, and foreign direct investment. The aim of this study is to attempt to determine the significance of the impact of openness to commodity trade flows on capital formation, as well as to determine whether such an impact is any different for economies classified as emerging markets than it is for developed nations.

The study proceeds by first providing a more detailed insight on the nature of the variables used, as well as an account of the methodology involved. Next, a number of methodologies and results obtained by previous studies are presented. Subsequently, the study addresses the underlying theoretical evidence and implications of openness on international trade, as well as its effects on other economic variables and then theoretically justifies the statistical model to be used. This is followed by an empirical analysis, for the purpose of which six nations will be selected. Among these countries, United States, Canada and United Kingdom are classified as developed nations while Thailand, Hungary and India are classified as emerging markets. Individual time-series regressions will then be conducted on pertinent data collected for each country over a 20 year period, along with the necessary statistical tests, namely the unit root, cointegration and autocorrelation tests. Finally, the findings will be discussed as a part of a comparison between the two groups of countries and conclusions will be drawn.

[2] Morgan Stanley Capital International

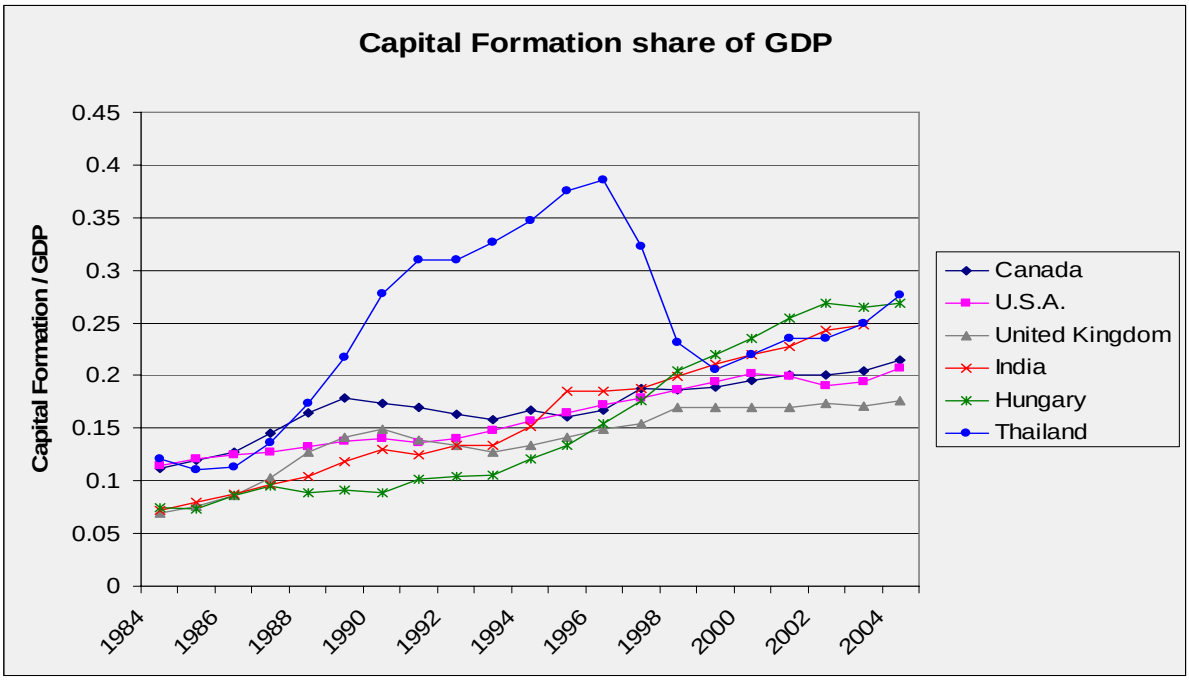
II. Pertinent Information

In order to gain a better understanding of the difference between developing nations and emerging markets it is essential to understand the two main potential causes responsible for the rise of emerging markets: failure of state-controlled economic development and a need for capital investment. First, state-led economic development failed to produce sustainable growth in the traditional developing countries, which pressed these countries to adopt more open policies, and to facilitate economic growth along market-oriented, rather than state-controlled lines. Second, the developing counties greatly needed capital to finance their development, but traditional government borrowing failed to effectively contribute to the development process. Borrowing from commercial banks or foreign governments and multilateral lenders, such as the IMF, resulted in a debt overload and a major economic imbalance. As a result of these inefficiencies, developing countries began to rely on equity investment as a vehicle of financing economic growth. In order to attract equity financing, a developing nation has to establish the preconditions of a market economy and create a business climate that meets the expectations of foreign investors. This change in financing sources thus became another factor leading to the rise of emerging markets.

For the purpose of this study, the selected emerging markets are Thailand, India and Hungary. Although these countries are significantly different in terms of size and nature of their economies, such a selection is geared at countering the effects of any regional trends, had the selection been made within a single geographic region. As for the developed nations, the United States, Canada and United Kingdom, all members of the G8, are selected due to their well-developed, powerful economies and their establishment as global players in the field of international trade. This study uses country-specific data over a 20-year period, ranging from 1984 through 2003. This period was marked by a number of significant trade agreements such as the 1994 WTO Agreement and the many multilateral trade agreements deriving from it, particularly the General Agreement on Tariffs and Trade (GATT 1994), the Antidumping and Subsidies Code, the General

Agreement on Trade in Services (GATS), the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and the Understanding on Rules and Procedures Governing the Settlement of Disputes. Throughout this period, our countries of interest have experienced a fairly steady increase in their capital formation to GDP ratio, with the exception of Thailand, in which case the capital formation underwent an immense shock, reaching nearly 40% of its GDP in 1996 and than falling sharply during the East Asian crisis of the late 1990's.

FIGURE 1 – Capital Formation as a share of GDP in selected countries: 1984-2004

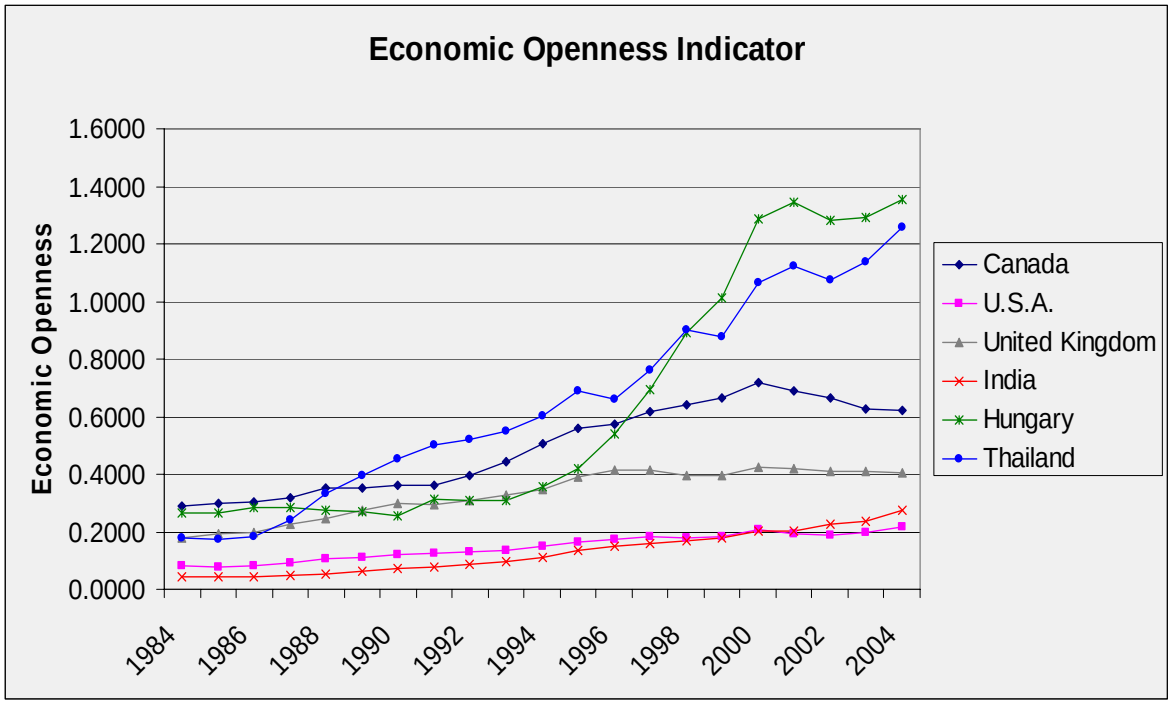


Thailand's sharp fall in capital formation was a result of a deep recession: as export growth - previously a key driver of the Thai economy - collapsed in 1996, resulting in the floating of the exchange rate by the central bank, consequently triggering a sharp increase in foreign liabilities that the strapped-for-cash Thai firms were already having trouble repaying.

As may be seen from **Fig. 1**, the economies classified as emerging markets have been experiencing a more intense growth of capital formation as a share of GDP in the last several years than the developed nations. However, despite such growth among these

economies, India, unlike Thailand and Hungary, did not exhibit as sharp an increase in its economic openness during the last decade, as may be seen in **Fig. 2**

FIGURE 2 – Economic openness indicator in selected countries: 1984-2004



India's lagging growth in economic openness, which reflects a slower foreign market penetration, may be attributed to the fact that India undertook a major step towards trade liberalization only in 1991, when a government program reduced trade barriers and removed investment restrictions across industries. A strong extent of protection is still present in the economy. Nevertheless, India does exhibit a stronger upward trend in its economic openness than the developed countries do. Whether such growth of capital formation share of GDP is correlated with openness to commodity trade flows remains to be determined. However, before proceeding, it is de rigueur to examine the earlier literature that deals with the issue.

III. Literature Review

The suggestion that foreign market penetration has a positive impact on a domestic country's GDP growth is not a new one. In contrast to the earlier neoclassical growth models, such as those developed by Sollow (1956), Cass (1965) and Koopmans (1965), later theories suggest that openness to international trade affects economic growth through technological improvement. A number of scholars, such as Romer (1992), Grossman and Helpman (1991) and Barro and Sala-i-Martin (1995) suggest that such technological improvement stems from the spillover of technology embedded in foreign goods and services. While some empirical studies such as Sachs and Warner (1995) and Sala-i-Martin (1997) do indeed find robust positive relationships between international trade and growth, other scholars, such as Harrison and Hanson (1999) and O'Rourke (2000) do not. There is still disagreement among economists concerning how a country's international economic policies and its growth of GDP and capital formation interact, even despite a number of multi-country case studies employing large cross-country data sets and analytical frameworks, as well as theoretical advances in growth theory.

Although relatively few studies are geared to determine the standalone impact of openness of international trade on capital formation, some arguments are nevertheless present in the literature. Aitken and Harrison (1999), perform a panel data analysis to determine the effects of foreign market penetration into the Venezuelan economy on the performance of domestic firms. This is done in order to attempt to question Venezuelan government's efforts to promote foreign direct investment in order to achieve "technology spillovers". Their findings indicate that an increase in productivity, although significant, is only applicable to joint ventures and that foreign competition has in fact a negative effect on the productivity of firms that are entirely domestically owned. Although similar studies done earlier did not find such a robust negative relationship, Aitken and Harrison point out that multinational corporations tend to choose the more productive sectors which are not necessarily representative of the economy as a whole. The main reasoning behind Aitken and Harrison's study is that openness to international trade and consequently a higher foreign direct investment naturally increases

international competition, which in turn may cause domestic investment to decline. They argue that such a decline would exceed the increase of capital formation fueled by foreign capital inflows, resulting in an overall decrease in capital formation. Similarly, they find no evidence supporting the existence of technology spillovers from foreign to domestic firms.

There are nevertheless a number of shortcomings in Aitken and Harrison's study. The primary concern is the time period used for panel analysis. Data from 1976 to 1989 does not necessarily represent the situation in the world today as markets grow increasingly more integrated with time. Another concern is that Venezuela does not necessarily adequately reflect other developing nations, as the scope for technological spillovers is certainly larger in export-oriented economies, such as the East-Asian economies. In fact, effects may vary for those nations whose development levels are either lower or higher than Venezuela. Furthermore, the study fails to gauge the long-term effects of openness: negative effects can only be transitory as markets continue to integrate throughout time. Finally, the study does not account for the eventual possibility of domestic technological spillover via labor mobility, as suggested by Yih-Chyi Chiang (1998).

One area which seems to produce a fair share of disagreement among scholars conducting openness-growth studies is the very concept of openness. A large number of measures of openness have been used throughout time: from the simple trade share of GDP used in this study to much more complex indicators that reflect trade policies. One particularly interesting study was done by Sebastian Edwards in 1998. He tests the robustness of the relationship between the following nine measures of openness and total factor productivity growth: 1) a ratio of taxes on imports and exports to total trade, 2) subjective index of trade distortions proposed by the Heritage Foundation 3) index of openness based on residuals from regressions explaining trade flows conceived by Edward Leamer in 1988, 4) Holger Wolf's (1993) regression-based index of import

distortions 5) average levels of import tariffs calculated by UNCTAD[3] 6) average coverage of non-tariff trade barriers calculated by UNCTAD 7) World Bank classification of trade strategies 8) Warner-Sachs trade policy index and 9) average black market premium on a nation's foreign exchange rate. Edwards performs a regression of these openness measure on estimated of ten-year averages of total factor productivity for a time span between 1960 and 1990. The sample consists of 93 countries, including both developed and developing nations. Edwards finds that six out of the above nine measure of openness are statistically significant in the anticipated sense.

A quandary with Edwards' results is that they are very contingent upon the fact that his regressions are weighted by the per-capita GDP. In fact, a more careful scrutiny of Edwards' work performed by Rodriguez and Rodrik in 2001 has revealed that if the per-capita GDP used by Edwards is weighted by its logarithm, only five of the openness measures return significant. Furthermore, they have discovered that the usage of White's correction for heteroskedasticity that number decreases further to four: the World Bank classification of trade strategies, the subjective index of trade distortions proposed by the Heritage Foundation, the black market premium on a country's foreign exchange rate and the a ratio of taxes on imports and exports to total trade. There are further problems with the remaining measures of openness: it would seem that changes in the exchange rate premium are influenced more by rudimentary macroeconomic policies, rather than trade policies. Finally, the Heritage Foundation openness indicator was calculated for trade barriers that existed in 1996, while Edward's study covers the 1980s: it is thus unclear that the regression will yield satisfactory results if the index was based on the 1980s data. Edward's study demonstrates that even though evidence of a positive correlation between openness and growth exists, no particular measure of openness may be deemed as ideal and absolute; therefore it is not inappropriate to use the simple total trade to GDP ratio for the purposes of this study.

[3] Same as used by Barro and Lee (1994)

Yet another study that attempted to break loose from the rest by employing an innovative measure of openness to international trade – is a study conducted by Jeffrey Frankel and David Romer in 1999. While this study does not deal directly with capital formation, it is nevertheless of interest for its inventive openness indicator. Frankel and Romer suggest that most studies that use the total trade share of GDP as a measure of openness find a positive relationship between openness and per-capita income. They point out however, that countries whose incomes are high for reasons unrelated to trade may have high trade ratios - the trade shares may be endogenous and therefore a more sophisticated measure of openness may be required. Frankel and Romer thus propose obtaining instrumental variables estimates of trade's effect on income by incorporating geographic characteristics of countries. The following variables are thus included in the trade equation: the size of countries, their distance from each other, whether they share a border, and whether they are landlocked. Frankel and Romer conclude that there is no evidence that the positive effect of trade on growth is overstated by previously used indicators. Furthermore, they argue that the consequences of geographic differences in trade are indicative of policy-based differences. The measure proposed by Frankel and Romer, however, may not necessarily be a valid instrumental variable, since a country's geographic situation may affect economic growth via a number of channels other than trade. Similarly, a country's geographic location may place it into a relative disadvantage, for example, via lowering its productivity through infectious diseases abundant in an area or by an excessively harsh climate, thus ultimately affecting economic growth. Nevertheless, Frankel and Romer's study is suggestive that the use of an openness measure that is based exclusively on the trade share of GDP yields comparable results to the use of a similar measure completed with the addition of geographic parameters. In turn, this may suggest that using an economic openness indicator based on the trade share of GDP is adequate.

A work of particular interest was performed by Jang Jin in 2004. Although not predominantly concerned with growth of capital formation rather than GDP growth, this study is nevertheless of interest because of the research methodology employed and because of Jin's findings regarding several landlocked Chinese provinces. Jin collects the

real GDP per capita, real capital formation and total employment for each Chinese province. His data ranges from 1978 to 1998. Jin than calculates an openness indicator for each province in each period, using the share of trade in the GDP as a measure of openness. Using employment and capital formation as control variables, Jin conducts independent time series regressions for each province in order to test the hypothesis that openness positively affects GDP growth. He finds that in most cases there is indeed a positive significant relationship between the extent of openness to international trade and output growth. Interestingly enough, he finds that in the case of certain landlocked provinces, the relationship between openness and economic growth is negative and significant. Jin attributes that finding to the inability of these provinces to compete internationally, thus leading to a decrease in domestic investment that is greater than the increase in foreign investment, in turn causing the overall capital formation to decrease. This is theoretically sound and consistent with the argument brought forth by Aitken and Harrison (1999). The methodology employed by Jin is equally interesting. As he is dealing with time-series, Jin employs the augmented Dickey-Fuller test to check for a presence of a unit root among the variables and upon discovery of such, corrects the problem with first differencing his variables, thus transforming them into first differences of logarithm. He further conducts an Engel-Granger cointegration test in order to test whether variables that possess a unit root share a common stochastic tendency. Since Jin's methodology appears to be most fitting and appropriate for the aims of a study on openness and capital formation, elements of this methodology will therefore be adopted.

All the same, Jin's study is not without its areas of concern. One of them is that the measure of openness chosen by Jin is based on trade flows and does a poor job accounting for the liberalization of capital markets. Since GDP growth is partly dependant on the growth of capital formation, an increase of openness in the capital markets may positively affect GDP growth through foreign direct investment. Jin is careful, however, to point out that "As an alternative to trade openness, it will also be desirable to include foreign direct investment as a proxy for financial market openness, but provincial data are not available. Readily available are trade data."[4]. Another area of

[4] See p. 1573

concern is that little effort has been made in order to determine if a feedback effect is present. Jin also notes that Granger causality is not examined because "Granger causal models that are involved with distributed lag structures deplete degrees of freedom quickly and the causal relationships in this case may appear to be distorted and insignificant perhaps due to degrees of freedom problem."[5]

Another interesting study was performed by Levine and Renelt (1992). Employing extreme bound analysis (EBA) proposed by Leamer (1983, 1985) in order to test the robustness of coefficient estimates to alternations in the conditioning information, they have conducted cross-country regressions on a 119 country sample in order to assess the statistical sensitivity of a number of past findings. Their data ranges from 1960 to 1989. Levine and Renelt use a large number of variables that have been the focus of attention in a broad collection of earlier growth studies. The study examines the statistical relationship between economic growth and a wide array of indicators that reflect economic policy. Levine and Renelt consider a relationship between growth and a variable of interest to be robust if it remains statistically significant and maintains a sign predicted by theory even after the conditioning set of variables in the regression has been changed. Among their findings, they conclude that a positive robust relationship exists between average share of capital formation in the GDP and the average share of trade in the GDP. Similarly, they confirm the existence of a positive robust relationship between average growth rates and the share of capital formation in the GDP. Finally, Levine and Renelt point out that an overwhelming majority of economic and political indicators, such as fiscal-expenditure, monetary-policy and political stability indicators are indeed not robustly correlated with growth or the capital formation share of the GDP.

This study is not without limitations, as it does relatively little to estimate structural models and establish causality links, rather to simply test whether partial correlations commonly mentioned in economic literature are robust to the changes in conditioning variables. Although the sample of 119 countries used by Levine and Renelt

[5] See p. 1580

is large and diverse, this diversity could lead to increasingly rigid criteria for the coefficients to be robust.

Overall, there does not seem to be a uniform consent regarding how the openness of an economy influences that country's capital formation and even its overall growth nor is there an agreement on how economic openness should be gauged. Furthermore, the bulk of related studies is concentrated on attempting to determine a general relationship between openness and a nation's output, often not according enough attention to the capital formation alone. The sample selection by most notable studies similarly may pose a problem, as the time periods often do not account for the fact that markets become increasingly integrated and therefore a more recent data set may reveal trends and relationships not present a decade ago. Finally, it is difficult to rely on prior studies for the purposes of this research; fairly little attention in the literature has been accorded to examining the relationships of interest specifically in the midst of emerging markets rather than developing countries, a fairly new concept that materialized as the globalization process pressed on.

IV. Theoretical Analysis

The model is based upon the framework of general production function with constant returns to scale, where the GDP is introduced as a function of capital, labor and technology.

$$Y = f(K, L, T) \qquad \textbf{(Equation 1)}$$

In this function, Y is the output (GDP), K is capital, L is labor rand T is technology. In this production function, L serves as a proxy for human capital. As Barro and Sala-i-Martin (1995) note, investment into education and human capital increases production efficiency via an increase in worker qualifications. Since our variable of interest is capital formation, this function may be rewritten in the following manner:

$$K = f(Y, L, T) \qquad \textbf{(Equation 2)}$$

In agreement with the new growth models, such as the one proposed by Romer (1986), technological change is presumed to be endogenous, therefore the openness of an economy can be used as a proxy for its level of technology (T):

$$T = f(OPEN)$$

Where OPEN is a rather simple indicator, gauging the extent of a given country's openness to international trade flows. This indicator is calculated as the ratio of total trade volume over the GDP:

$$OPEN = \frac{IM + XM}{GDP}$$

Such an indicator implies that an increase in economic openness reflects an intensification of a nation's involvement in international trade. An increase in exports provides incentives for domestic technological improvement in order to satisfy foreign market's increasing requirements, whereas in increase in imports stimulates domestic economy via increased productivity that stems from the technology entrenched in goods coming from abroad. Openness to foreign trade therefore should lead to greater growth through increased competition, enhanced efficiency, and the exchange of ideas and technology, thus promoting the accumulation of knowledge and human capital (Bregman

and Marom, 1993). According to endogenous growth models for consumption goods (Grossman and Helpman, 1991) and for intermediary goods (Romer,1990), the introduction of new imported consumption goods in an economy reduces the cost of further R&D and the introduction of new imported intermediary goods raises capital formation.

Model Specification

The empirical model is thus based on **Eq. 2** and is specified as follows:

$$CAPF_t = \phi + \alpha GDPCAP_t + \beta POP_t + \gamma OPEN_t + \varepsilon_t$$

In the model above, the variable CAPF is the ratio of capital formation to GDP, GDPCAP is GDP per capita, POP is population, OPEN refers to the economic openness indicator and ε_t are the residuals. Provided that the variables in **Eq. 2,** are capital, output, labor and technology, they have been replaced by proxy variables. CAPF is used as a proxy for capital (K) and OPEN as a proxy for technological change (T), whereas GDPCAP [proxy for output(Y)], and POP [as a proxy for labor (L)] are used as control variables. Undergoing a logarithmic transformation, all the variables of the above model are measured in terms of their natural logarithms.. The transformed model therefore appears as:

$$\ln CAPF_t = \phi + \alpha \ln GDPCAP_t + \beta \ln POP_t + \gamma \ln OPEN_t + \varepsilon_t$$

However, as will be shown later in section **V**, Augmented Dickey-Fuller tests (see **Tables 3** and **4**) reveal that a unit root exists for some variables and that first-differencing the variables remedies that problem of non-stationarity. Consequently, the variables of the model are now measured in first differences of logarithm. This new model is specified as follows:

$$\Delta \ln CAPF_t = \phi + \alpha \Delta \ln GDPCAP_t + \beta \Delta \ln POP_t + \gamma \Delta \ln OPEN_t + \varepsilon_t$$

Taking first differences of logarithm not only remedies the non-stationarity problem and produces percentage changes of the variables from period to period, but also allows for

correcting for the potential problem of linear inter-correlation between the variables, should such exist.

To recap, theory suggests that an increase in openness to international trade will consequently trigger an increase in capital formation. Nevertheless, some claims such as those made by Aitken and Harrison (1999) suggest that increased economic openness will lead to an obvious augmentation of international competition, which, in turn, will trigger a drop in domestic investment. This diminishment in domestic investment will exceed the increase in foreign investment caused by foreign capital inflows, resulting in the overall decline of capital formation. In the next section, this study will attempt to determine whether the impact of openness on capital formation is significant or not and whether this impact is the same for developed countries and emerging markets. Similarly, the nature and the sources of collected data, the empirical analysis of the model, and the obtained results will be presented and discussed.

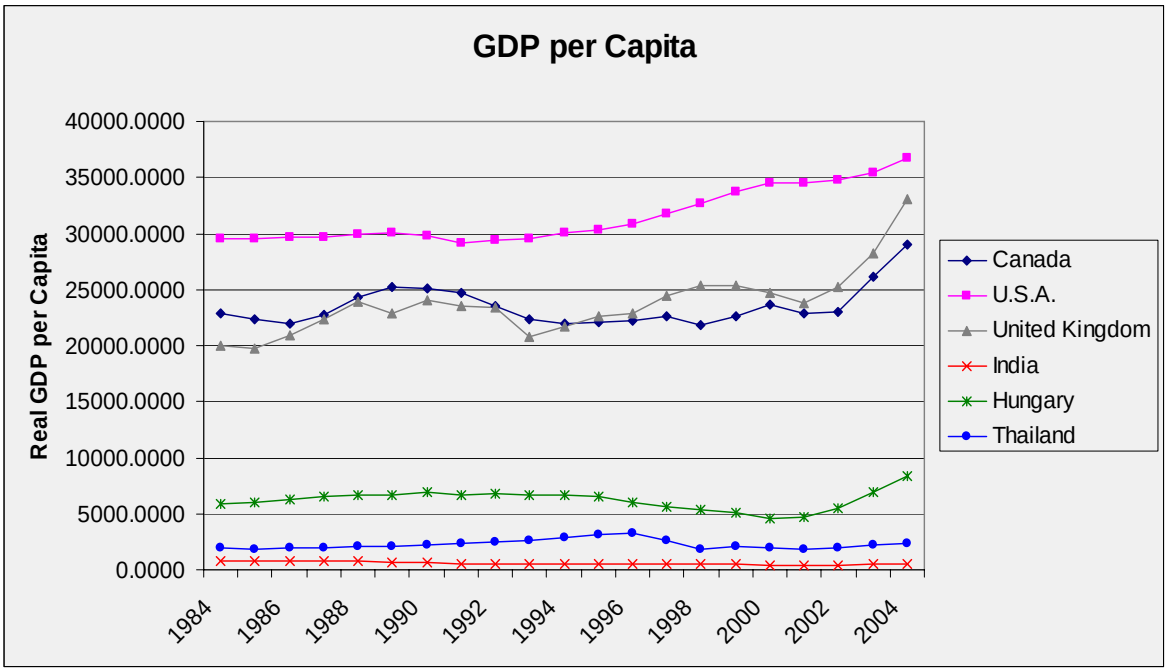
V. Empirical Analysis

Data

This study uses a 20-year period for the purposes of analysis, ranging from 1984 through 2003. As was mentioned earlier, this period is marked by a number of multilateral trade agreements and growing economic dependencies between nations which contributed to an overall decline of trade barriers worldwide. The variables used for each country are the capital formation to GDP ratio [CAPF], population [POP], GDP per capita [GDPCAP] and openness to international trade [OPEN]. GDP is calculated for each country by first converting the GDP from national currency to US dollars using the nominal exchange rate in each period (period average) and then deflated using U.S. consumer price index [2000=100]. The gross fixed capital formation for each country is similarly converted to USD using nominal exchange rates. CAPF is obtained with both variables measured in billions of US dollars. OPEN is calculated with imports, exports and GDP all in millions of US dollars. GDPCAP, as well as POP, are integrated in the model as control variables. GDPCAP is obtained with both GDP and population measured in actual numbers (as opposed to billions or millions). Finally, POP is also measured in actual numbers rather than millions. All the data for all periods was obtained from the *International Financial Statistics* database published by the IMF.

Figure 3 below clearly shows the GDP per capita gap between emerging markets and developed countries. It is obvious from Figure 3, that despite an accelerated rate of growth of capital formation to GDP ratio in the last decade (depicted in **Figure 1**), emerging markets still lag far behind developed nations in terms of GDP per capita, even despite the recent global economic recovery from the crisis caused by the 9/11 attacks. With the exception of Hungary, which joined the European Union on May 1st, 2004, there appears to be little trend for improvement for Thailand and India.

FIGURE 3 – GDP per capita in selected countries: 1984-2004



It is equally interesting the compare the yearly averages for GDP per capita, population, capital formation to GDP ratio and openness indicator between developed nations and emerging markets. **Table 1** below presents just such a comparison. As expected, developed countries were more open to international trade prior to the last decade of the 20th century. In the 1980's the average openness of emerging markets began to grow at a higher rate than the average openness of developed countries. In 1990, the selected emerging markets and developed nations were roughly equal in the extent of their openness to international trade. As this trend continued, the average economic openness of emerging markets was more than double than the openness of developed countries by the end of 2003.

TABLE 1 – Comparison of averages between emerging markets and developed countries

AVERAGES COMPARISON

	DEVELOPED COUNTRIES				EMERGING MARKETS			
	GDP per Capita (USD) 2000=100	Population (millions)	Cap. Formation / GDP (%)	Openness	GDP per Capita (USD) 2000=100	Population (millions)	Cap. Formation / GDP (%)	Openness
1984	24144.96	107.34	0.10	0.18	2888.61	270.14	0.09	0.16
1985	23875.22	108.30	0.11	0.19	2852.42	275.75	0.09	0.16
1986	24192.71	109.28	0.11	0.20	2966.47	281.43	0.10	0.17
1987	24953.69	110.26	0.13	0.21	3056.78	287.19	0.11	0.19
1988	26071.21	111.26	0.14	0.23	3160.39	293.01	0.12	0.22
1989	25995.81	112.29	0.15	0.25	3170.05	298.89	0.14	0.24
1990	26334.44	113.33	0.15	0.26	3288.16	304.81	0.17	0.26
1991	25790.78	114.41	0.15	0.26	3219.78	310.76	0.18	0.30
1992	25416.39	115.50	0.15	0.28	3302.20	316.75	0.18	0.30
1993	24214.58	116.61	0.14	0.30	3290.21	322.75	0.19	0.32
1994	24564.46	117.73	0.15	0.33	3357.09	328.76	0.21	0.36
1995	25006.07	118.86	0.16	0.37	3389.58	334.75	0.23	0.42
1996	25335.27	119.99	0.16	0.39	3279.81	340.71	0.24	0.45
1997	26274.69	121.12	0.17	0.40	2915.40	346.66	0.23	0.54
1998	26606.59	122.25	0.18	0.41	2523.23	352.57	0.21	0.65
1999	27255.76	123.38	0.18	0.42	2534.25	358.43	0.21	0.69
2000	27596.35	124.50	0.19	0.45	2339.30	364.25	0.22	0.85
2001	27048.01	125.62	0.19	0.43	2320.11	370.01	0.24	0.89
2002	27671.72	126.74	0.19	0.42	2653.00	375.71	0.25	0.86
2003	29941.12	127.85	0.19	0.41	3185.17	381.36	0.25	0.89

We observe a similar picture when comparing the yearly averages of capital formation as a share of GDP. It is evident from **Table 1** that capital formation to GDP ratio follows a similar trend as openness to international trade: as openness increases at accelerated rates in the emerging markets, so does the percentage of GDP represented by capital formation, reaching an average of 25% by the end of 2003. While this comparison does not provide a definitive answer to our question of interest, it may suggest a positive relationship between the extent of foreign market penetration and a share of GDP represented by capital formation.

Autocorrelation Tests

Before proceeding further, it is appropriate to conduct autocorrelation tests in order to assure that no serial correlation in the residuals takes place. We employ the

Breucsh-Godfrey autocorrelation test for this purpose, which is used in order to test for higher-order autocorrelation. The test ranges from one to twelve lags under the null hypothesis H_0: no serial correlation and the test's results are presented on a country by country basis in **Table 2** below.

TABLE 2– Breusch-Godfrey autocorrelation test

Breusch-Godfrey test for serial correlation

Canada	*USA*	*U.K.*	*Thailand*	*India*	*Hungary*
0.0612	0.2711	0.0903	0.3762	0.0971	0.0769
0.0798	0.5106	0.1614	0.0697	0.0627	0.1767
0.1673	0.7024	0.2671	0.1322	0.1324	0.2865
0.1078	0.5984	0.2300	0.2303	0.1539	0.1403
0.0720	0.5709	0.2254	0.3237	0.2424	0.1881
0.0401*	0.3288	0.0980	0.4155	0.2160	0.0544
0.0655	0.2572	0.0567	0.4299	0.2544	0.0822
0.1011	0.3043	0.1210	0.5340	0.2396	0.0637
0.1357	0.1986	0.0846	0.3103	0.3147	0.0971
0.1841	0.2221	0.0522	0.2411	0.0921	0.1059
0.2028	0.2016	0.0623	0.3013	0.1225	0.1486
0.2322	0.1344	0.0847	0.1215	0.1508	0.1922

Note: The numbers reported are p-values for the Breusch-Godfrey autocorrelation test.

*lag 6 – presence of autocorrelation detected.

Using a 5% significance level (α=0.05), we accept the null hypothesis that no serial correlation is present for all countries, lag 1 through 12. One exception is present for Canada, but however is deemed negligible. This indicates that no further corrections for serial correlation are necessary.

Unit Root and Cointegration Tests

Unit root tests are essential in examining the stationarity of a time series, as stationarity of regressors is assumed in the derivation of standard inference procedures for regression models and non-stationary regressors invalidate many standard results and require special treatment. For the purposes of this study, an augmented Dickey-Fuller test

will be employed in order to test each series for a presence of a unit root. Adopting the methodology of Jin (2004), we begin by regressing each variable on a linear deterministic trend, a constant, a dependant lagged variable and q lags of first differences in the following manner:

$$\lambda_t = \alpha + \beta_t + \rho \ln \lambda_{t-1} + \theta_1(\ln \lambda_{t-1} - \ln \lambda_{t-2}) + ... + \theta_q(\ln \lambda_{t-q} - \ln \lambda_{t-q-1}) + \varepsilon_t$$

Where λ_t represents the variable of interest (measured in terms of its natural logarithm). Following a convention proposed by Jin (2004), in order to render the residuals ε_t white noise, we set the lag *q* at two years. We shall test the null hypothesis H_0: $\rho=1$ which indicates a presence of a unit root versus the alternative hypothesis H_1: $\rho<1$, $\alpha\neq0$, $\beta\neq0$, which indicates stationarity. The tests statistics of the augmented Dickey-Fuller test are presented in **Table 3**. With only a few exceptions, most of the variables are non stationary, as we cannot reject the null hypothesis that states a presence of a unit root.

TABLE 3 – Augmented Dickey-Fuller test for unit root: natural logarithms of variables

Dickey Fuller Test - ln of variables				
Countries	**OPENNESS**	**CAP. F / GDP**	**GDP / CAPITA**	**POPULATION**
Canada	-1.12	-4.24	-0.89	-2.24
USA	-0.05	-1.73	-1.52	-0.22
U.K.	-0.95	-5.14	-4.53	-2.23
Thailand	-2.86	-1.91	-1.50	-0.06
India	-1.09	-2.04	-0.80	-2.05
Hungary	-2.58	-2.24	-2.17	-3.81

Note: above are the t-statistics for the Dickey Fuller. The interpolated critical value for the 5% level is approximately -3.6 and for the 10% level is approximately -3.24

Provided the presence of non-stationary variables, it is possible to remedy this problem via first-differencing. **Table 4** presents test statistics of augmented Dickey-Fuller tests on the model variables measured in terms of first difference of logarithm. As it becomes evident from **Table 4,** most of the variables test negative for non-stationarity therefore it is suitable to employ first-differencing as a means of solving the problem of non-stationarity.

TABLE 4 - Augmented Dickey-Fuller test for unit root: first differences of the natural logarithms of variables

Dickey Fuller Test - First differences

Countries	OPENNESS	CAP. F / GDP	GDP / CAPITA	POPULATION
Canada	-3.70	-4.94	-2.95	-1.90
USA	-3.62	-2.71	-4.56	-3.81
U.K.	-4.66	-3.84	-1.74	-4.24
Thailand	-5.61	-3.71	-3.77	-3.68
India	-4.60	-4.52	-3.64	-1.29
Hungary	-3.79	-3.61	-3.87	-3.74

Note: above are the t-statistics for the Dickey Fuller. The interpolated critical value for the 5% level is approximately -3.6 and for the 10% level is approximately -3.24

Another concern that arises is that variables that possess a unit root share a common stochastic tendency. If this be the case, there exists a long term equilibrium relationship between the variables, thus a linear combination between two variables from non-stationary series is itself stationary. In this case, differentiating the variables leads to a model misspecification and corrective measures should be undertaken. In order to verify if this is actually the case, we employ the Engle and Granger test, a cointegration test. The test consists of two steps: we begin by estimating the following equation:

$$\ln X_{1t} = \alpha_1 + \alpha_2 t + \alpha_3 \ln X_{2t} + \alpha_4 \ln X_{3t} + \alpha_5 \ln X_{4t} + u_t$$

Where X_t are our variables of interest for each country, ranging from one to four and μ_t is white noise. The second step is to predict the residuals for this model and then test the residuals for the presence of a unitary root using the augmented Dickey-Fuller test (setting lags to two). The results of the Engle-Granger test are presented in **Table 5** below.

TABLE 5 – Engle-Granger test for cointegration

Engle-Granger Test

Countries	OPENNESS	CAP. F / GDP	GDP / CAPITA	POPULATION
Canada	-3.511	-2.282	-2.806	-3.046
USA	-2.991	-1.829	-1.957	-1.361
U.K.	-1.654	-1.107	-1.789	-2.414
Thailand	-2.156	-2.475	-2.357	-2.539
India	-3.423	-2.722	-3.109	-1.612
Hungary	-3.158	-1.335	-2.362	-1.070

Note: below are the t-statistics for the Engle-Granger. According to McKinnon (1991), the critical value for the 10% level is approximately -4.79

As may be observed, no variables are cointegrated, since the null hypothesis of no cointegration (H_0: $\rho=1$) cannot be rejected for all variables at a 5% significance level, therefore including a correction term in the model is not necessary and the use of first-differencing is suitable for conducting the regressions.

Vector Autoregression

In order to establish causality and to determine whether a feedback effect is present, a vector autoregression was conducted. The results, concentrating on the two variables of interest are presented in **Table 6** below.

TABLE 6 – Vector Autoregression Results

Vector Autoregression

	Canada	*United States*	*United Kingdom*	*India*	*Thailand*	*Hungary*
Openness*	0.675	0.243	0.858	0.034†	0.012†	0.038†
Capital Formation / GDP **	0.046†	0.152	0.489	0.402	0.085	0.079

*Effect of openness on capital formation share of GDP

**Effect of capital formation share of GDP on openness

† Significant at a 5 % level

These results indicate that in the case of India, Thailand and the Hungary the effect of openness on capital formation is significant, while in the case of Canada, the effect of capital formation on openness appears to be significant. The latter effect may easily be attributed to the fact that an increase in capital formation creates favorable condition for export-oriented multinational corporations. These multinationals thrive on cheap labor and attractive tax legislations, increasing exports and therefore inflating the openness indicator used throughout this study. All the same, a vector autoregression is not without shortcomings. It is important to note that causal relationships may appear distorted due to a problem which often persists when dealing with causality and distributed lag models: degrees of freedom are depleted and otherwise significant relationships may appear insignificant.

Regression Results

Table 7 below presents the results from individual regressions that were conducted using the model specified earlier in section **IV**.

TABLE 7 - Individual regression results

	GDP per capita	***Population***	***Openness***	***Adj.R2***
EMERGING MARKETS				
Thailand	0.86*	9.48	0.68*	0.70
	(0.1610433)	(7.909172)	(0.199301)	
India	0.52*	13.98*	0.41*	0.43
	(0.195819)	(5.682176)	(0.1648115)	
Hungary	0.17	-0.36	0.53*	0.47
	(0.2084221)	(9.049008)	(0.1513508)	
DEVELOPED COUNTRIES				
USA	0.75**	27.03**	0.19**	0.39
	(0.401895)	(14.08747)	(0.1055253)	
Canada	0.52**	8.71	0.16	0.12
	(0.291503)	(6.45699)	(0.2376234)	
U.K.	0.57*	-71.88**	0.45	0.47
	(0.230715)	(36.44356)	(0.2847851)	

Note: Standard errors are reported in brackets.

*Significant at 5% level

**Significant at 10% level

The regression results suggest that openness to international trade bears positive effects on the rate of growth of capital formation for both developed countries and emerging markets. These effects are statistically significant for all of the emerging markets at a 5% significance level. However, as for the developed countries, while Canada and the United Kingdom do not present any significant effects of openness, the impact of openness is significant at a 10% level in the case of United States. The results obtained for India, Thailand and Hungary are consistent with the results obtained by Levine and Renelt (1992) who found a robust positive relationship between openness to international trade and the rate of growth of capital formation. It is important to note, that the model does indeed present a better fit in the case of emerging markets as it may be noted from the more elevated adjusted R^2.

As expected, the openness coefficients for the emerging markets are found to be on the average higher than those of developed countries, as greater economic openness observed for the emerging markets is likely to attract direct foreign investments. Similarly, given that the economic openness indicator serves as a proxy for gauging the presence of trade barriers, foreign and domestically-owned manufacturers and service providers are likely to flourish in the now more open emerging markets, provided relatively low labor costs and tax liabilities. All the coefficients for openness appear positive, which is indeed the expected outcome predicted by theory. Although certain studies[6] suggest that increased openness to international trade is indeed harmful for some developing countries whose economies are unable to compete internationally, this is most certainly not the case of emerging markets.

As was pointed out earlier, the year 1990 was roughly the time when the average economic openness of emerging markets rivaled the openness of developed countries. Similarly, the rate of growth of openness in the emerging markets generally started exceeding the rate of growth of openness in the developed nations around the mid-to-late 1980's. A similar trend ensues for the capital formation as a percentage of the GDP, albeit to a lesser magnitude. There are a number of plausible explanations for such a trend

[6] See Aitken and Harrison (1999)

in the emerging markets, chiefly the restructuring of these markets in order to meet the standards and demands of foreign investors and to be able to compete internationally. In Hungary, the former Eastern block economy has conducted its trade reforms most swiftly: between 1989 and 1991, Hungary has completely abrogated the state monopoly on foreign trade. A vast majority of imports was liberated from licenses and quotas and the average tariff rate was lowered significantly. Further restructuring and adjustments ensued, as Hungary has engaged in new trade opportunities, particularly with the European Union, the European Free Trade Association and its partners in the Central European Free Trade Agreement. 1991 was equally an important year for India, when the economic reform process has put an end to investment, industrial and import licensing, and ended public sector monopoly in many sectors, thereby allowing automatic approval of foreign direct investment. Still, unlike Hungary, India remains a mixed economy, displaying a relatively high degree of protection. Foreign direct investment inflows remain at comparatively low levels, depriving India of extra impulses necessary for growth and competitiveness on world markets. This accounts for the fact that India's openness coefficient, as obtained by the regression, is smaller than in the case of Hungary and Thailand as well as for the fact that India's growth in capital formation as a share of GDP does not correspond to the growth in its openness.

Another reason behind larger size and higher significance of openness coefficients for emerging markets is indubitably the technological progress, particularly the advances in telecommunications and information technologies, as well as the surfacing of the internet. Along side the restructuring of the markets, such technological advances were made accessible through the liberalization of trade and in turn have greatly expanded the horizons of foreign direct investment and international trade in these countries via financial markets expansion, resulting in a surge of investments pouring in. At its pinnacle, this tendency is reflected by Thailand's capital formation reaching nearly 40% of its GDP circa 1996. While the emerging markets were seen as potential but unstable goldmines by many western investors, not much has changed in the midst of the already developed economies, where the technological advances did not have such a drastic introduction as a consequence of trade liberalization and changes in the market structure.

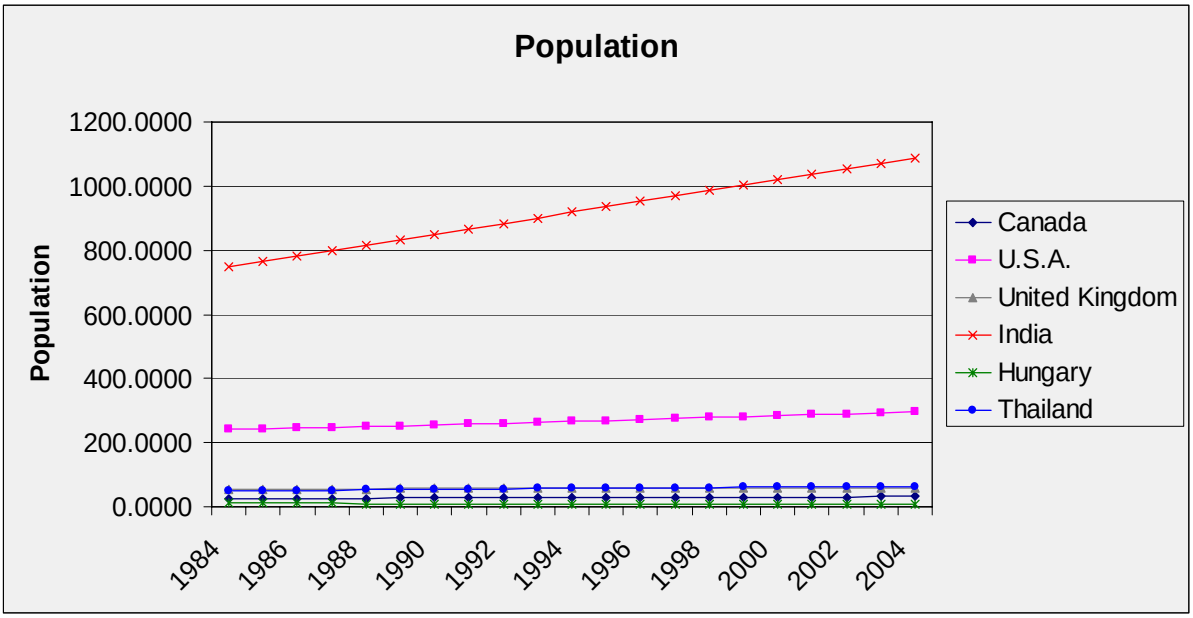
Further research geared on determining the effects of technological advances in the fields of telecommunications and information technology on economic openness and capital formation in the emerging markets is necessary in order to fully substantiate this suggestion.

The openness coefficients are found to be positive for both emerging markets and developed countries, which contradicts Aitken and Harrison's (1999) argument that an increase in openness suppresses domestic investment via increased competition and that the increase in foreign direct investment is not sufficient to make up for the loss of domestic investment, thus total capital formation decreases. The nature of the standalone impact of an increase in openness on domestic and on foreign investment is difficult to determine, thus it is unclear whether domestic investment in the emerging markets is robust to foreign competition or whether the increase in foreign direct investment simply makes up for the decrease in domestic investment. However, the fact that no openness coefficient is significant at a five percent level in the case of developed countries leads to suspect that despite an openness-fuelled inflow of foreign investments into these countries, a decrease in domestic investment took place as local firms had a difficult time facing foreign competition from firms who take advantage of lower labor costs, safety and emission standards, and finally lower corporate tax rates.

As for the control variables in the regressions, it de rigueur to note that the GDP per capita coefficients are found to be positive for all nations and significant at a 5 percent level for India, Thailand and United Kingdom and significant at a 10 percent level for USA and Canada. Since the GDP per capita is being used as a proxy for output, it is natural to expect that an increase in the rate of growth of GDP per capita will lead to an increase in the rate of growth of capital formation, as capital formation is an integral part of the GDP. This finding is more accurate for emerging markets than for the developed countries, which is substantiated by the fact that capital formation represents a larger share of GDP in the emerging markets and thus the GDP of emerging markets is more sensitive to fluctuations in capital formation. Finally, the coefficients for POP,

representing the rate of population growth and being used as a proxy for labor (L), are found to be significant at a 5 percent level for India and at a 10 percent level for the United States and the United Kingdom – the nations with the largest populations. As may be seen from **Figure 4** below, both United States and India experienced higher population growth rates from 1984 to 2004 than other countries in the sample.

FIGURE 4 – Population growth in selected countries: 1984-2004



In the case of United Kingdom and Hungary, however, the population coefficients are found to be negative, which may be explained by labor inefficiencies. It is necessary to point out that certain earlier studies, such as Jin (2004), found similar negative relationships between labor and economic growth.

VI. Conclusion

This study attempts to gauge the effect of openness to international trade on capital formation and to determine whether such an impact is different for emerging markets than it is for developed countries. For comparison purposes, this study selects Thailand, Hungary and India as emerging markets and United States, Canada and the United Kingdom as developed nations. Measuring capital formation in terms of its share of GDP and measuring openness to international trade as a ratio of total trade to GDP, individual time-series regressions were conducted for each of the selected countries. The findings reveal that openness to international trade has a positive effect on capital formation in both developed countries and emerging markets. Openness coefficients are statistically significant at a 5 percent level for all the countries classified as emerging markets, while only significant for the United States at a 10 percent level and not significant for Canada and United Kingdom. This relationship is stronger for emerging markets, as may be seen from the generally higher coefficients. The model certainly presents a better fit when applied to emerging markets: the adjusted R^2 suggests that on average, in the case of emerging markets, 53 percent of the variation of capital formation is explained by the selected variables, whereas this number is only 33 percent in the case of developed countries.

There are a number of plausible rationalizations that could potentially explain the fact that openness bears a more significant effect on capital formation in the case of emerging markets. First, restructuring and changes in policy direction have led to more investor-favorable market conditions in the emerging markets, as it is reflected by an increase in the openness indicator. This increased openness, combined with reduced corruption and increased accountability has attracted flows of foreign investments, notably from foreign manufacturers and service providers who benefit from relatively low labor costs and tax legislations as well private and institutional investors from the West who took advantage of the financial markets liberalization. The rush of foreign direct investment into these countries has naturally increased their capital formation. Second, relatively recent advances in the fields of information and telecommunications

technology, as well as the emergence of the internet coincide with a general increase in openness in the midst of emerging markets. This suggests that such technology has facilitated and encouraged foreign direct investment into the emerging markets, as many forms of foreign investment would simply not be possible today without the use of information and telecommunications technologies. Such was not the case in the developed countries, where radical market restructuring was not necessary and thus did not take place. While protectionist policies were being curtailed and the said advances in the information and telecommunication technologies did increase openness significantly, the flow of investment was directed outwards to the emerging markets. It should not be surprising that increased openness did not have significant effects on capital formation in the developed countries: even though these now more open economies did attract investments from abroad, lower labor costs and standards, as well as corporate tax rates in the developing countries have made it difficult for local firms to face foreign competition, thereby reducing domestic investment and in turn, reducing national capital formation. This may suggest that recent speculations regarding the economic dangers of outsourcing are perhaps not unfounded.

This study is not without shortcomings. Its main limitation is that it does not explicitly separate capital formation into domestic and foreign investment[7], which renders a judgment on the nature of the impact of openness difficult to pass. Although outside the scope of this study, considering domestic and foreign direct investment separately would certainly shed more light on the effects of technological spillover that stems from the international transfer of goods and services, as it is outlined by endogenous technological change theories. Moreover, it would permit to further investigate the reasons behind a lower significance of the openness coefficients in the case of developed countries and to empirically substantiate the suggestion that a decrease in domestic investment created by an increase of foreign competition is what causes this lower significance. Finally, a potential drawback of not separating capital formation into domestic and foreign investment is that the rationale behind the impact of openness is based largely on theoretical rather than on empirical grounding. Another shortcoming of

[7] Foreign direct investment can be used as a proxy for capital markets openness.

this study lies in the fact that no special attention is given to considering the standalone effects of the advances in the telecommunication and IT fields on openness and foreign investment[8]. Further research in this field would be essential in order to determine the role of communications technology in the economic development of emerging markets. Last but not least, the measure of economic openness used in this study may prove not to be sufficient in order to reflect the openness of capital markets, which, plays an integral part in determining the flows of foreign direct investment. The use of an additional indicator that gauges the extent of capital markets' liberalization would thus prove beneficial for further research in this field.

[8] See Mattoo, A.; Rathindran, R.; Subramanian, A. (2001).

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